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Sandia National Laboratories
Waste Isolation Pilot Plant

Compliance Recertification
FEPs Reassessment Analysis Plan

AP-095
REVISION 2

W.B.S. 1.3.5.3.1

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ACRONYMS

AP	Analysis Plan
BOE	Basis of Estimate
CARD	Compliance Application Review Document
CCA	Compliance Certification Application
CD	Compliance Decision
CFR	Code of Federal Regulation
CM	Conceptual Model
CRA	Compliance Recertification Application
DOE	Department of Energy
DP	Disturbed Performance
DRC	Document Review and Comment
EPA	Environmental Protection Agency
ERMS	Electronic Records Management System
FEPs	Features, Events, and Processes
FTL	FEPs Team Leader
IPI	Implementing Principal Investigator
M&OC	Management and Operating Contractor
NP	Nuclear Waste Management Program (NWMP) Procedure
NWMP	Nuclear Waste Management Program
PA	Performance Assessment
PI	Principal Investigator
QA	Quality Assurance
R&A	Review and Approval
RTC	Response to Comment
SNL	Sandia National Laboratories
SO-C	Screened Out-Consequence
SO-R	Screened Out-Regulatory Exclusion
SO-P	Screened Out-Probability
TSD	Technical Support Document
UP	Undisturbed Performance
WIPP	Waste Isolation Pilot Plant
WPO	WIPP Project Office

1 Introduction and Objectives

This Analysis Plan (AP) describes the process used to update the Waste Isolation Pilot Plant (WIPP) Features, Events and Processes (FEPs) baseline for the Compliance Recertification Application (CRA). Analysis Plan AP-090, entitled *FEPs Assessment Analysis Plan,* contains important introductory information on the FEPs baseline and development and is therefore pre-requisite reading. The objective of the work performed under this AP shall result in a replacement to Appendix SCR of the 1996 Compliance Certification Application (CCA; DOE 1996) for the CRA.

1.1 Background

The Environmental Protection Agency (EPA) has certified the WIPP's compliance with their radioactive waste disposal standards (EPA 1998a). These disposal standards are stringent and state that the Department of Energy (DOE) must demonstrate a reasonable expectation that the probabilities of cumulative radionuclide releases from the disposal system during the 10,000 years following closure will fall below specified limits (EPA 1993). The performance assessment (PA) analyses supporting this determination must be quantitative and must consider uncertainties caused by all significant FEPs that may affect the disposal system, including inadvertent human intrusion into the repository during the future. The Certification Criteria at Title 40 CFR § 194.32(e), state that:

> Any compliance application(s) shall include information which:
>
> (1) Identifies all potential processes, events or sequences and combinations of processes and events that may occur during the regulatory time frame and may affect the disposal system;
>
> (2) Identifies the processes, events or sequences and combinations of processes and events included in performance assessments; and
>
> (3) Documents why any processes, events or sequences and combinations of processes and events identified pursuant to paragraph (e)(1) of this section were not included in performance assessment results provided in any compliance application.

Therefore, the PA process is based on comprehensive consideration of the FEPs that are determined to be relevant to disposal system performance. The development of the FEPs baseline was documented in Appendix SCR of the CCA (DOE 1996). This appendix described the process DOE used to first compile a comprehensive list of FEPs, screen them against a set of criteria, and justify the selection and rejection of those FEPs that would (or would not) be represented in the PA conceptual models (CMs). Those FEPs that were shown by the screening analyses to have the potential to affect performance were included in quantitative calculations using a system of linked computer models to evaluate the interaction of the repository with the natural system, both with and without human intrusion. Appendix SCR documents the selection and rejection of FEPs to be considered in PA, however it *does not* describe how a FEP is to be implemented in PA. The implementation of FEPs is outside the scope of the reassessment in this AP.

The reassessment conducted per this AP may identify changes in the FEPs baseline. Identification of these changes, should they occur, will be assessed as the next step in the PA methodology update for the CRA PA. Secondly, EPA regulations contain specific reporting requirements that include formal notification by DOE if a condition or activity is identified that changes a baseline screening decision or necessitates inclusion of a new FEP into the compliance baseline (EPA 1996). Since WIPP's initial certification, no such event has prompted DOE to report a change in the FEPs screening decisions and therefore these decisions are not expected to change as a result of this assessment. This assessment shall update the DOE's position on FEPs and include new and relevant information from EPA and other project sources such as the monitoring and experimental programs.

The CCA contained DOE's FEPs baseline and the history behind the generation of the final FEPs list. The EPA evaluated DOE's compliance application in part to determine if the WIPP complied with 40 CFR 194.32(e). The EPA's review is documented in a Technical Support Document (TSD) entitled "Scope of Performance Assessment" which contains a thorough review the FEPs baseline (EPA 1998b). In reviewing the DOE's FEPs baseline, EPA developed their own numbering scheme different than that used by DOE. The revised baseline will use EPA's scheme. In some instances, EPA performed a more in-depth review of specific FEPs. These reviews were also documented in other EPA documents found in docket A93-02. EPA also requested additional information from DOE relating to FEPs screening during the compliance review. These requests and DOE's responses are also found in the EPA's docket. The information contained in this docket comprises the compliance baseline; FEPs are a subset of the compliance baseline. In order to develop a complete, comprehensive documentation of the updated FEPs baseline, a review of all relevant compliance baseline documents is needed.

The WIPP project continues to evolve as the project matures. This evolution is influenced by DOE initiatives to increase disposal rates, by new waste information (concerning existing streams and new proposed waste streams), proposed changes to the WIPP design, experimental results designed to confirm PA-related assumptions and uncertainties, and external information from sources outside the WIPP project (e.g., international waste programs). Because these changes have the potential to affect information in the FEPs baseline, assessments of impact are conducted as needed. In addition to project changes, baseline FEPs information may have been affected by positions made by the EPA in their certification deliberations, or by supplemental information provided by the DOE. Therefore, for the CRA, this reassessment activity will update the FEPs baseline and document important information relating to the FEPs basis and screening decisions. For cases where no new information warrants updating a FEP, no changes are necessary to the FEPs baseline. The Management and Operating Contractor (M&OC) has developed a change index that lists such changes and will help to provide focus on the scope of this reassessment.

2 Approach

2.1 Scope of CRA FEP Assessment

The scope of the CRA FEPs assessment includes a complete reassessment of the information contained in the compliance baseline and any new information relating to the screening decisions, justifications and basis originally documented in CCA's Appendix SCR. The objective of this task is to develop a revised Appendix SCR to be included in the November 2003 CRA. This reassessment is composed of two elements. In the first element, a process is used to identify those FEPs that require an in-depth review as well as those unaffected since the first certification of WIPP. The second element reassesses in detail each FEP potentially affected by new information. For the second element, a common set of tools is developed and used to assist in the identification of new information related to each FEP further evaluated in the reassessment. These tools include the baseline FEPs list, related experimental results, literature search materials, and DOE and EPA documents that contain the FEP positions and information relating to changes incorporated into the WIPP baseline. Each Principal Investigator (PI) shall use these tools, this AP, and a specific documentation format to reassess each FEP that was not eliminated in the first reassessment element, resulting in a meaningful and current FEPs baseline. The scope of this task is only to update the FEPs baseline where appropriate and is not intended to add or bolster existing arguments where the original FEPs information remains sufficient, accurate, and current.

As was done in the previous FEPs assessment that led up to the writing of Appendix SCR, the scope of this reassessment does not include assessing the implementation of the FEPs into PA. FEPS are implemented in the applicable scenario and conceptual models and are determined adequate in part via independent peer review.

2.2 FEPs Reassessment Team Assignment

The PA Manager shall assign a FEPs Team Leader (FTL). The FTL shall delegate staff to complete the tasks associated with Section 2.3. The FTL will review the FEPs list, segregate the FEPs into logical technical area (e.g., near field, far field, chemistry, etc…), conduct activities associated with Element 1 of this reassessment, and make FEPs assignment recommendations to the Compliance Manager for those FEPs requiring further reassessment. The Compliance Manager shall assign appropriate PIs to lead specific technical area FEPs reassessments. Each PI is responsible for completing the FEPs reassessment per this AP. The FTL is responsible for documenting that all FEPs listed in Attachment 1 of AP-090[1] have been evaluated through this reassessment process.

[1] Reading of AP-090, FEPs Assessment Analysis Plan is a prerequisite to performing work under this analysis plan. The WIPP FEPs list is controlled through AP-090.

2.3 Reassessment Element 1: Identify FEPs that Require In-Depth Review

Due to the magnitude of information relating to each FEP and the considerable effort involved in reassessing each FEP, a process has been developed to identify FEPs that have not been impacted by changes to the compliance baseline or do not require further evaluation for the purposes of recertification. FEPs identified in this phase of the reassessment are eliminated from further evaluation.

2.3.1 Sorting Process

Initial sorting of all FEPs listed in the baseline FEPs list is necessary to identify those FEPs that require extensive review and those FEPs that may be excluded. Because FEPs related to human activities are of significant importance to intrusion scenarios within the WIPP PA, and because human activities have the potential to change frequently, all FEPs related to human activities have been set aside for extensive review.

Alternatively, those FEPs currently accounted for in either disturbed or undisturbed scenarios may be excluded from extensive review because their effects are currently included in PA. Furthermore, the WIPP monitoring and reporting activities have not identified any information that would suggest removal of these FEPs from consideration in PA. Finally, FEPs screened out on regulatory basis can be excluded from further consideration within this reassessment because the regulatory basis has not been modified since WIPP's original certification. Figure 2.1 provides a logic diagram of this sorting process within the first element of this reassessment.

Using the sorting criteria above results in the elimination of 76 FEPs from further review, and identifies 161 FEPs that will proceed through the second element of this reassessment. Attachment 1 provides a list of the FEPs that will undergo in-depth investigation in the second element of this reassessment plan. The remainder of this plan describes the tools, steps, and documentation requirements for the FEPs identified in Attachment 1.

2.4 Develop FEPs Reassessment Tools

The next step in the FEPs reassessment process is to gather existing information relating to the FEPs to make common tools for use by the assigned PIs and staff. The information shall consist of a tabulated list of FEPs found in EPA's TSD, *"Scope of Performance Assessment"* and Appendix SCR. The table shall include, but is not limited to, the following information:

- FEPs list with screening determinations and linking of EPA FEPs nomenclature to those in SCR;
- Reference WIPP Project Office (WPO) numbers, electronic records management system (ERMS) numbers, SCR call-outs, TSD locations and Compliance Application Review Documents (CARD) references;

- Reference of material relating to FEPs in Reponses to "EPA Request for Additional Information;"
- Listing of side efforts; and
- Change Index that lists changes that have occurred within the WIPP project since certification.

2.5 Determine Resources and Schedule

The FTL shall coordinate with the assigned FEPs PIs and develop a schedule that complies with the Basis of Estimate (BOE) Milestones for the FEPs reassessment deliverables. Key milestone dates include:

- Assign FTL	December 2002
- Assign FEPs to PIs and Initiate Analysis	January 2003
- Provide FEPs tools to PIs	January 2003
- PIs provide Drafts of SCR to FTL	March 2003
- Appendix SCR Review Draft	April 2003
- SCR Formal Review	April-June 2003
- Final Appendix SCR	June 2003

The dates listed are subject to change; the BOE milestones and DOE direction dictate actual deliverables and completion dates.

2.6 Outline FEPs Reassessment Process

The process for reassessing FEPs is described in the flow chart of Figure 2.1. The reassessment starts after all FEPs listed in AP-090 have been assigned to the appropriate PIs. The FTL is then responsible for coordinating the reassessment process and compilation of materials for the revised Appendix SCR. The basic process shall be to: (1) compile a file of information for each FEP containing all relevant information from the compliance baseline; (2) research activities relating to the FEP and FEP baseline information; (3) determine, based on a checklist, if the FEP baseline requires updating and if so in what manner; (4) develop text for a revised Appendix SCR for each FEP assigned; and (5) document the assessment in a formal records package.

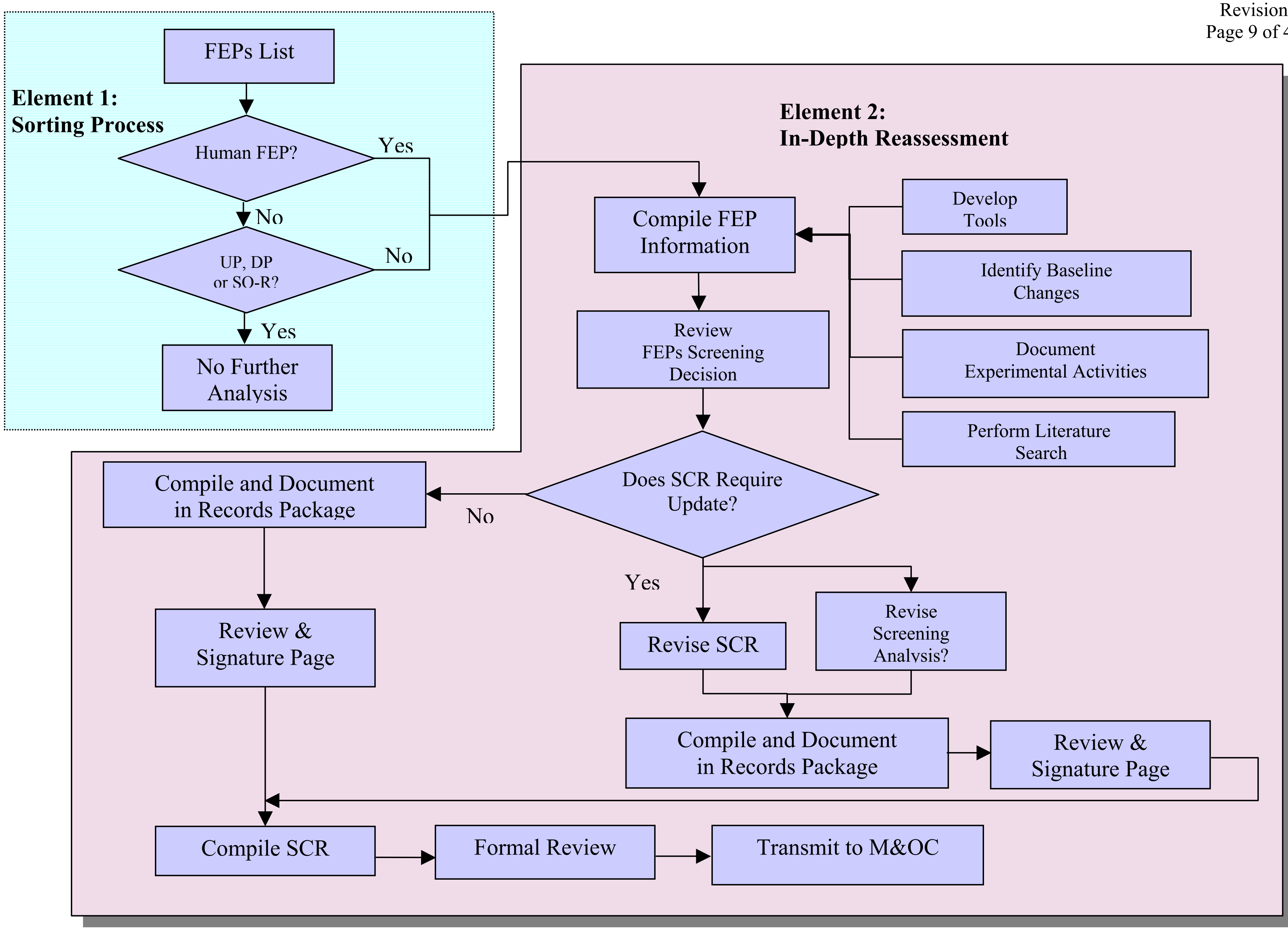

Figure 2.1 FEPs Reassessment Flow Chart

2.5.1 Compile FEP Information

The PIs assigned to specific FEPs are responsible for performing a comprehensive review of information and activities that have occurred since the May 18, 1998 certification of WIPP. The objective of the reassessment is to update each FEP to ensure that the information relating to the screening decisions are current and valid. The tools derived in Section 2.3 are intended to help in the reassessment by providing most of the information that made up the original FEPs basis and screening decision. However, there were varying degrees of analysis and documentation relating to each FEP such that the PIs assigned to each FEP must be diligent in their research of baseline information to ensure a complete compilation of relevant baseline materials. Examples of review materials may include analysis plans, packages, test plans, experimental results, publications, seminar materials, etc. To compile FEPs information, the PIs shall consider identified baseline changes, documented experimental results, and information available through a search of open literature on the topic. These materials should be compiled or properly referenced in a records package. The PI is responsible for developing one record package for their assigned FEPs. The title of the package must state "CRA FEPs Reassessment" and list each FEP number. Attachment 2 to this document contains the FEPs Reassessment Records Package Submittal cover sheet, and must be used for each FEP reassessment. The FTL will collect all packages from the assigned PIs and submit one CRA FEPs records package to the records center following the conclusion of the Appendix SCR revision.

2.5.2 Review Original FEP Screening Decision

In this step, the PIs review the original FEPs screening decisions and analyses. If the original decision and supporting materials are acceptable as written, no further action is required for this step. To better understand the basis for which the screening decisions were made, the following describes the screening definitions. The PA process is based on comprehensive consideration of the FEPs that are relevant to disposal system performance. A process called "screening" is used to determine if a FEP is relevant and therefore accounted for within the PA framework. FEPs are screened out using specific rationale. These are:

Screened Out, Explicit Regulatory Exclusions	(SO-R)
Screened Out, Probability	(SO-P)
Screened Out, Consequence	(SO-C)

Those FEPs that are shown to have the potential to affect performance are accounted for in the development of scenarios and their resulting conceptual models. These "screened in" FEPs are classified based on the PA scenario to which they apply:

Screened in, Undisturbed Performance	(UP)
Screened in, Disturbed Performance	(DP)

Those FEPs classified as either UP or DP are represented in the appropriate scenarios, models, and assumptions in the PA system. Figure 1 of AP–090, presents the general PA methodology and the important steps in the PA process (Wagner and Kirkes 2002). A detailed description of the PA process is included in Chapter 6 of the CCA (DOE 1996).

As previously stated, certain FEPs are screened according to provisions in 40 CFR Part 191 and 40 CFR Part 194. In developing and demonstrating the feasibility of the 40 CFR Part 191 standard and the 40 CFR Part 194 criteria, the EPA considered and made conclusions on the relevance, consequence, and/or probability of occurrence of particular FEPs and, in so doing, allowed for some FEPs to be eliminated from consideration. FEPs of this nature have a screening designation of SO-R (screened out – regulation). For example, low-probability events can be excluded on the basis of the criterion provided in 40 CFR § 194.32(d), which states "…performance assessments need not consider processes and events that have less than one chance in 10,000 of occurring over 10,000 years." In practice, for most FEPs screened out on the basis of low probability of occurrence, it has not been possible to estimate a meaningful quantitative probability.

FEPs can also be eliminated from PA calculations on the basis of insignificant consequence (SO-C) (screened out–consequence). Consequence can refer to effects on the repository or site or to radiological consequence. Therefore, the DOE has omitted events and processes from PA calculations where there is a reasonable expectation that the remaining probability distribution of cumulative releases would not be significantly changed by such omissions.

FEPs that are potentially beneficial to subsystem performance may be eliminated from PA calculations if necessary to simplify the analysis (SO-C). This argument may be used when there is uncertainty as to exactly how the FEP should be incorporated into PA calculations or when incorporation would incur unreasonable difficulties. Therefore, elimination of the beneficial consequence is considered a conservative position.

FEPs that are represented in the PA are classified as UP (screened-in, undisturbed performance, and DP (screened-in, disturbed performance).

2.5.3 Determine if SCR Requires Revision

This step in the reassessment process determines if the FEPs description and decision in Appendix SCR is adequate as written. The PI should use the information compiled in Section 2.5.1, the FEPs checklist (see below), and a regulatory assessment consultation with the FTL to determine if revision to Appendix SCR is necessary.

The PI is responsible for coordinating the activities necessary to update the FEPs screening decision basis. As stated in Section 1.1, no screening decision should change. If the PI determines that a screening decision should change, the PI must notify the FTL. A change to the screening decision is outside the scope of this AP because it requires notification to EPA and possible modification of the certification decision through rulemaking, a condition that cannot be included in the CRA. Most decisions that screen out a FEP are comprehensive and sometimes contain qualitative or quantitative assessments. FEPs that are screened in are accounted for within the PA methodology, and contain little screening decision documentation in Appendix SCR. The FEPs that are screened out will require the most attention for this assessment.

In assessing whether the screening decision should be updated, the PI should consult with the FTL for guidance with regulatory issues associated with their FEP screening decision. For example, FEPs related to drilling activities may have no new monitoring data or information that would result in updating the original screening decisions. However, because the EPA is sensitive to FEPs related to human activities such as drilling, additional discussions will be necessary for the revised Appendix SCR that demonstrate a thorough review of the available information has been performed and supports the conclusion that there are no impacts to the original screening decisions. In cases where changes to the FEP baseline occur, the PI must identify the appropriate implementing PI (IPI). The IPI is responsible for the development, implementation, and in some cases, parameterization of the FEP within the appropriate conceptual model(s).

The following checklist was developed as a guide to help determine whether the materials in Appendix SCR should be updated. This list is provided as a starting point and is not all-inclusive or appropriate for all FEPs. The PI is responsible for determining whether the material in Appendix SCR is adequate or requires updating. If an update is deemed necessary, the PI is then responsible for determining the appropriate information necessary to revise Appendix SCR. The PI is also responsible for determining the information to be included in the FEPs reassessment records package. Attachment 2 provides the FEPs Reassessment Records Submittal Cover Page template. This template serves as the records submittal cover page and provides the necessary sign-off and approval authorization.

<u>FEPs Checklist</u>

Screened in FEPs

- Does the description/decision in Appendix SCR adequately describe current understanding of the FEP?
- Is the description/decision in Appendix SCR consistent with the discussion in the EPA's TSD/CARD/Response to Comments Document (RTC)?
- Is there an associated analysis, and if so, is it current with literature/experimental activities/EPA's TSD/CARD/RTC positions?

Screened out FEPs

Complete Screened in FEPs checklist above, and

- Does new information infer that an analysis is necessary to explain the impact of this new information?

After assessing the Appendix SCR description/decision, the PI shall document the decision by either revising the appropriate Appendix SCR text or by composing a summary paragraph that precedes the original CCA FEPs Appendix SCR section. This summary paragraph shall state that the review has concluded that no new information or activities have been realized that change the description or screening decision (and analysis if any).

3 Documentation of FEPs Reassessments

The FEPs reassessment must document the results of the assessment in a consistent and clear manner. An adequate records package must be generated to include the materials used in the assessment, document activities relating to the reassessment and provide an auditable record that demonstrates a thorough review of each FEP was conducted in a systematic manner. Any revision to the SCR text must be consistent with the type and style of revision used by other authors. Therefore, the following guidance is presented to help ensure consistency within the documentation of the FEPs reassessment. The FTL should coordinate reviews of drafts, provide format and content guidance and ensure consistency in the final SCR revision.

3.1 Format of SCR/Analysis

The format for the revised SCR text shall remain consistent with the CCA text except for EPA numbering and an explanation preceding the section text, either summarizing the basis for the changes made, or the basis for why the section text remains the same. The FTL is responsible for ensure consistency between the text revisions. All drafts of the revised text and additions must be provided to the FTL for review prior to submitting the draft text through the Document Review and Comment (DRC) process. Attachment 3 provides a format guide to be used when developing revised SCR text.

3.2 Content of Records Package

The results of the reassessment will produce a record for each FEP that documents the activity. The record should contain at a minimum, the original CCA SCR text, the proposed revised text, a detailed explanation of the assessment, relevant text from EPA TSDs and CARDs, and references to other materials used in the assessment. In addition, the record must contain the DRC form (NP form 6-1-1) of the reassessment package and analysis (if any), and a signature page for each FEP. Attachment 2 to this AP provides a template for the record submittal cover page.

The FTL is responsible for coordinating with the M&OC team lead responsible for the CRA. The FTL shall compile the proposed SCR text and materials from the PIs. The FTL is responsible for coordinating with the PIs to ensure a complete and consistent draft of SCR, prior to a formal internal review of the draft. Upon completion of the review, the FTL shall submit the draft SCR to the M&OC team lead.

The reports that document the results of the FEPs reassessments must follow SNL document control requirements. Any new calculations supporting FEPs Impact Assessments shall follow documentation protocol according to Appendix B of SNL procedure NP 9-1. In addition, SNL procedure NP 6-1 shall be used for document review and control. All records shall be placed in a unique records package by the FTL. Distribution of the final documents by the FTL to the intended customer shall be transmitted under the SNL Project Manager's letterhead.

4 Special Considerations

4.1 References

References used to support FEPs screening decisions and analyses must be limited to publicly accessible material. All references must be currently available and not exclusively copyrighted materials that may not be accessible to stakeholders. All reference to SNL materials must have the appropriate level of Quality Assurance (QA) applied and documented in the references records package. Reference documents used to support FEPs that were generated by SNL for conferences and general public release must meet SP 6-1 requirements (i.e., use of R&A Form SF 1008-RA). Reference materials may be used if the material is either included in the CRA (e.g., included in the new appendix MASS or has/will be submitted to the EPA's recertification docket).

4.2 Analyses

All analyses will be conducted in accordance with applicable QA procedures, following the Compliance Decision (CD) requirements of Nuclear Waste Management Program (NWMP) QA procedure NP 9-1.

4.3 Records

All records generated for FEPs analyses or SNL information referenced in the revised Appendix SCR text must have traceable records generated under NP 17-1 and NP 6-1.

5 Applicable NWMP Plans and Procedures

AP-090	FEPs Assessment Analysis Plan
NP 2-1	Qualification and Training
NP 6-1	Document Review Process
NP 6-2	Document Control Process
NP 9-1	Analyses
NP 9-2	Parameters
NP 17-1	Records
NP 19-1	Software Requirements
SP 6-1	Publicly Released Documents

6 References

DOE (U.S. Department of Energy). 1996. *Compliance Certification Application*. DOE/CAO-1996-2184, Carlsbad Area Office, Carlsbad, NM.

EPA (U.S. Environmental Protection Agency). 1993. *40 CFR Part 191 Environmental Radiation Protection Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes; Final Rule,* Federal Register. Vol. 58, no. 242, 66398-66416.

EPA (U.S. Environmental Protection Agency). 1996. *40 CFR Part 194: Criteria for the Certification and Re-Certification of the Waste Isolation Pilot Plant's Compliance With the 40 CFR Part 191 Disposal Regulations; Final Rule,* Federal Register. Vol. 61 no.28, 5224-5245.

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EPA (U.S. Environmental Protection Agency). 1998b. *Technical Support Document for Section 194.23: Sensitivity Analysis Report*. EPA Air Docket A-93-02, Entry V-B-13.

Wagner, S. W., and Kirkes, G. R. 2002. FEPs Assessment Analysis Plan, AP-090. Sandia National Laboratories, June 2002. ERMS# 522779. Sandia National Laboratories Carlsbad Programs Group, Carlsbad, NM.

ATTACHMENT 1

Element 2 FEPs List

Element 2 FEPs

EPA FEP I.D.	FEP Name	Issue	Screening Classification	Comments on Classification	CCA Cross References
N3	Changes in regional stress	Tectonic activity on a regional scale may change levels of stress	SO-C		**SCR.1.1.2** Section 2.1.5
N4	Regional tectonics	Tectonic setting of the region governs current level of stress	SO-C		**SCR.1.1.2** Section 2.1.5 Appendix FAC, Section 6.4
N5	Regional uplift and subsidence	Tectonic activity on a regional scale could cause uplift and subsidence	SO-C		**SCR.1.1.2** Section 2.1.5
N6	Salt deformation	Salt formations may deform under gravity or other forces	SO-P	UP near repository.	**SCR.1.1.3.1** Section 2.1.6.1 Appendix DEF, Section 2.3
N7	Diapirism	Buoyancy forces may cause salt to rise through denser rocks	SO-P		**SCR.1.1.3.1** Appendix DEF, Section 3.1 Appendix DEF, Section 2
N8	Formation of fractures	Changes in stress may cause new fracture sets to form	SO-P	UP near repository.	**SCR.1.1.3.2** Section 2.1.5
N9	Changes in fracture properties	Changes in the local stress field may change fracture properties such as aperture and asperity	SO-C	UP near repository.	**SCR.1.1.3.2** Section 2.1.5.2 *Section 2.2.1* *Section 6.4.6.2*
N10	Formation of new faults	Tectonic activity on a regional scale could cause new faults to form	SO-P		**SCR.1.1.3.3**
N11	Fault movement	Movement along faults in the Rustler or in units below the Salado could affect the hydrogeology	SO-P		**SCR.1.1.3.3** *Section 2.1.5.2* Section 2.1.5.3 Appendix GCR, Section 4.4 Appendix FAC, Section 6.4
N13	Volcanic activity	Igneous material feeding volcanoes or surface flows could affect disposal system performance	SO-P		**SCR.1.1.4.1** Appendix GCR, Section 3.5

EPA FEP I.D.	FEP Name	Issue	Screening Classification	Comments on Classification	CCA Cross References
N14	Magmatic activity	Subsurface intrusion of igneous rocks could affect disposal system performance	SO-C		**SCR.1.1.4.1** Section 2.1.5.4 Appendix GCR, Section 3.5
N15	Metamorphic activity	High pressures and/or temperatures could cause solid state recrystallization changes	SO-P		**SCR.1.1.4.2**
N17	Lateral dissolution	Dissolution at the Rustler - Salado contact may create pathways and/or increase transmissivity	SO-C		**SCR.1.1.5.1** Section 2.1.6.2 Appendix DEF, Section 3.2 Appendix FAC, Sections 3.1.2 , 4.1.1 and 8.9
N18	Deep dissolution	Dissolution in the Castile or at the base of the Salado may create pathways	SO-P		**SCR.1.1.5.1** Section 2.1.6.2 Appendix DEF, Section 3.1
N19	Solution chimneys	Dissolution cavities in the Castile or at the base of the Salado may propagate towards the surface	SO-P		**SCR.1.1.5.1** Section 2.1.6.2 Appendix DEF, Section 3.1
N20	Breccia pipes	Formations above deep dissolution cavities may fracture	SO-P		**SCR.1.1.5.1** Section 2.1.6.2 Appendix DEF, Section 3.1
N21	Collapse breccias	Dissolution may result in collapse of overlying units	SO-P		**SCR.1.1.5.1** Section 2.1.6.2 Appendix DEF, Section 3.1 Appendix FAC, Section 7.2.4
N22	Fracture infills	Precipitation of minerals as fracture infills can reduce hydraulic conductivities	SO-C		**SCR.1.1.5.2** Appendix FAC, Section 8.8
N26	Density effects on groundwater flow	Spatial variability of groundwater density could affect flow directions	SO-C		**SCR.1.2.1** Section 2.2.1.4.1.2
N28	Thermal effects on groundwater flow	Natural temperature variability could cause convection or otherwise affect groundwater flow	SO-C		**SCR.1.2.2**

EPA FEP I.D.	FEP Name	Issue	Screening Classification	Comments on Classification	CCA Cross References
N29	Saline intrusion [hydrogeological effects]	The introduction of more saline water into the Rustler could affect groundwater flow	SO-P		**SCR.1.2.2**
N30	Freshwater intrusion [hydrogeological effects]	The introduction of freshwater into the Rustler could affect groundwater flow	SO-P		**SCR.1.2.2**
N31	Hydrological response to earthquakes	Fault movement can affect groundwater flow directions and pressure changes can affect groundwater levels and movement	SO-C		**SCR.1.2.2** Section 2.6.2 Appendix GCR, Section 5
N32	Natural gas intrusion	The introduction of natural gas from formations beneath the repository could affect groundwater flow	SO-P		**SCR.1.2.2** Section 2.3.1.2
N34	Saline intrusion (geochemical effects)	The introduction of more saline water into the Rustler could affect actinide retardation and colloid stability	SO-C		**SCR.1.3.2**
N35	Freshwater intrusion (geochemical effects)	The introduction of freshwater into the Rustler could affect actinide retardation and colloid stability	SO-C		**SCR.1.3.2**
N36	Changes in groundwater Eh	Changes in oxidation potentials could affect radionuclide mobilization	SO-C		**SCR.1.3.2**
N37	Changes in groundwater pH	Changes in pH could affect colloid stability and the mobility of radionuclides	SO-C		**SCR.1.3.2**
N38	Effects of dissolution	Dissolution could affect groundwater chemistry and hence radionuclide transport	SO-C		**SCR.1.3.2**
N40	Impact of a large meteorite	A large meteorite could fracture the rocks above the repository	SO-P		**SCR.1.4.2**
N41	Mechanical weathering	Processes such as freeze -thaw affect the rate of erosion	SO-C		**SCR.1.4.3.1**
N42	Chemical weathering	Breakdown of minerals in the surface environment affects the rate of erosion	SO-C		**SCR.1.4.3.1**

EPA FEP I.D.	FEP Name	Issue	Screening Classification	Comments on Classification	CCA Cross References
N43	Aeolian erosion	The wind can erode poorly consolidated surface deposits	SO-C		**SCR.1.4.3.2**
N44	Fluvial erosion	Erosion by rivers and streams could affect surface drainage	SO-C		**SCR.1.4.3.2**
N45	Mass wasting [erosion]	Gravitational processes can erode material on steep slopes	SO-C		**SCR.1.4.3.2**
N46	Aeolian deposition	Sand dunes and sheet sands may be deposited by the wind and affect surface drainage	SO-C		**SCR.1.4.3.3**
N47	Fluvial deposition	Rivers and streams can deposit material and affect surface drainage	SO-C		**SCR.1.4.3.3**
N48	Lacustrine deposition	Lakes may be infilled by sediment and change the drainage pattern	SO-C		**SCR.1.4.3.3**
N49	Mass wasting [deposition]	Land slides could block valleys and change the drainage pattern	SO-C		**SCR.1.4.3.3**
N50	Soil development	Vegetation and surface water movement are affected by soil type.	SO-C		**SCR.1.4.4**
N51	Stream and river flow	The amount of flow in streams and rivers affects erosion and deposition	SO-C		**SCR.1.5.1** Section 2.2.2 Appendix GCR, Section 6.2.1
N52	Surface water bodies	The disposition of lakes is a control on the surface hydrology	SO-C		**SCR.1.5.2** Section 2.2.2 Appendix GCR, Section 6.2.1
N57	Lake formation	Formation of new lakes will affect the surface hydrology	SO-C		**SCR.1.5.4**
N58	River flooding	Flooding will affect the area over which infiltration takes place	SO-C		**SCR.1.5.4**
N62	Glaciation	Natural climate change could lead to the growth of glaciers and ice sheets	SO-P		**SCR.1.6.2.2** Appendix CLI

EPA FEP I.D.	FEP Name	Issue	Screening Classification	Comments on Classification	CCA Cross References
N63	Permafrost	The regions in front of advancing ice sheets will be subject to frozen ground preventing infiltration	SO-P		**SCR.1.6.2.2**
N64	Seas and oceans	The volume and circulation patterns in seas and oceans would affect the distribution of radionuclides	SO-C		**SCR.1.7.1**
N65	Estuaries	Water movement in estuaries would affect the distribution of radionuclides	SO-C		**SCR.1.7.1**
N66	Coastal erosion	Coastal erosion could affect the local groundwater system	SO-C		**SCR.1.7.2**
N67	Marine sediment transport and deposition	Transport and deposition could affect the distribution of radionuclides	SO-C		**SCR.1.7.2**
N68	Sea level changes	Sea level change would affect coastal aquifers	SO-C		**SCR.1.7.3**
N69	Plants	Plants play a role in the hydrological cycle by taking up water	SO-C		**SCR.1.8.1** Section 2.4.1
N70	Animals	Burrowing animals can affect the structure of surface sediments	SO-C		**SCR.1.8.1** Section 2.4.1
N71	Microbes	Microbes can be important in soil development. Microbes in groundwater may sorb radionuclides	SO-C	UP for colloidal effects and gas generation	**SCR.1.8.1** Appendix MASS, Section 15.3.2
N72	Natural ecological development	Changes in climate may cause changes in the types of vegetation and animals present	SO-C		**SCR.1.8.2** Appendix CLI
W4	Container form	The type and shape of waste container will affect heat dissipation and container strength	SO-C		**SCR.2.1.3** Appendix DVR, Section 12.2
W8	Seal chemical composition	The chemistry of seal materials could affect actinide speciation and mobility	SO-C	Beneficial SO-C	**SCR.2.1.4** **SCR.2.5.2**

EPA FEP I.D.	FEP Name	Issue	Screening Classification	Comments on Classification	CCA Cross References
W9	Backfill physical properties	The amount and distribution of backfill could affect porosity and permeability in disposal rooms	SO-C		**SCR.2.1.5** Appendix BACK, Section 3.2
W11	Post-closure monitoring	Inappropriate monitoring after closure could affect performance	SO-C		**SCR.2.1.6** Appendix MON, Section 6
W13	Heat from radioactive decay	Radioactive decay of waste will generate heat in the repository	SO-C		**SCR.2.2.2**
W14	Nuclear criticality: heat	A sustained fission reaction would generate heat	SO-P		**SCR.2.2.3** *Section 6.4.6.2* *Section 6.4.5.2* *Appendix MASS*
W15	Radiological effects on waste	Radiation can change the physical properties of many materials	SO-C		**SCR.2.2.4** *Section 6.4.3.4* *Section 6.4.3.5* *Section 6.3.3.6*
W16	Radiological effects on containers	Radiation can change the physical properties of many materials	SO-C		**SCR.2.2.4** *Section 6.4.3.4* *Section 6.4.3.5* *Section 6.3.3.6*
W17	Radiological effects on seals	Radiation can change the physical properties of many materials	SO-C		**SCR.2.2.4** *Section 6.4.3.4* *Section 6.4.3.5* *Section 6.3.3.6*
W23	Subsidence	Salt creep and roof falls could lead to subsidence of horizons above the repository	SO-C		**SCR.2.3.4** *Section 2.2.1.4.1.2* *Appendix TFIELD*
W24	Large scale rock fracturing	Salt creep and roof falls could lead to fracturing between the repository and higher units or the surface	SO-P		**SCR.2.3.4**
W28	Nuclear explosions	A critical mass of plutonium in the repository could explode if rapidly compressed	SO-P		**SCR.2.3.6**
W29	Thermal effects on material properties	Temperature rises could lead to changes in porosity and permeability	SO-C		**SCR.2.3.7** Appendix SEAL, Section 7.4

EPA FEP I.D.	FEP Name	Issue	Screening Classification	Comments on Classification	CCA Cross References
W30	Thermally-induced stress changes	Elevated temperatures could change the local stress field and alter the rate of salt creep	SO-C		**SCR.2.3.7**
W31	Differing thermal expansion of repository components	Stress distribution and strain changes can depend on differing rates of thermal expansion between adjacent materials	SO-C		**SCR.2.3.7**
W33	Movement of containers	Density differences or temperature rises could lead to movement of containers within the salt	SO-C		**SCR.2.3.8**
W34	Container integrity	Long-lived containers could delay dissolution of waste	SO-C	Beneficial SO-C	**SCR.2.3.8** Section 6.5.4
W35	Mechanical effects of backfill	Backfill in disposal rooms will act to resist creep closure	SO-C		**SCR.2.3.8** Appendix BACK, Section 3.2
W38	Investigation boreholes	Improperly sealed investigation boreholes near the repository could act as release pathways	SO-C		**SCR.2.3.8** *Section 6.4.4* Appendix DEL *Appendix MASS*
W43	Convection	Temperature differentials in the repository may lead to convection cells	SO-C		**SCR.2.4.3**
W46	Effects of pressure on microbial gas generation	Increases in gas pressure could affect microbial populations and gas generation rates	SO-C		**SCR.2.5.1.1**
W47	Effects of radiation on microbial gas generation	Radiation could affect microbial populations and, therefore, gas generation rates	SO-C		**SCR.2.5.1.1**
W50	Galvanic coupling	Potential gradients between metals could affect corrosion rates	SO-P		**SCR.2.5.1.2** *Appendix GCR*
W52	Radiolysis of brine	Alpha particles from decay of plutonium can split water molecules to form hydrogen and oxygen	SO-C		**SCR.2.5.1.3** Section 6.4.3.3 *Section 6.4.3.5* *Section 6.4.3.6* Appendix MASS, Section 8

EPA FEP I.D.	FEP Name	Issue	Screening Classification	Comments on Classification	CCA Cross References
W53	Radiolysis of cellulose	Alpha particles from decay of plutonium can split cellulose molecules and affect gas generation rates	SO-C		**SCR.2.5.1.3**
W54	Helium gas production	Reduction of alpha particles emitted from the waste will form helium	SO-C		**SCR.2.5.1.3** Section 6.4.3.3 Appendix BIR
W55	Radioactive gases	Radon will form from decay of Pu. Carbon dioxide and methane may contain radioactive ^{14}C	SO-C		**SCR.2.5.1.3** Appendix BIR
W57	Kinetics of speciation	Reaction kinetics control the rate at which particular reactions occur thereby dictating which reactions are prevalent in non-equilibrium systems	SO-C		**SCR.2.5.2**
W59	Precipitation of secondary minerals	Precipitation of secondary minerals could affect the concentrations of radionuclides in brines and groundwaters	SO-C	Beneficial SO-C	**SCR.2.5.3**
W60	Kinetics of precipitation and dissolution	The rates of dissolution and precipitation reactions could affect radionuclide concentrations	SO-C	Kinetics of waste dissolution is a beneficial SO-C	**SCR.2.5.3**
W65	Reduction-oxidation fronts	Redox fronts may affect the speciation and hence migration of radionuclides	SO-P		**SCR.2.5.5**
W67	Localized reducing zones	Localized reducing zones, bounded by reduction-oxidation fronts, may develop on metals undergoing corrosion	SO-C		**SCR.2.5.5**
W68	Organic complexation	Aqueous complexes between radionuclides and organic materials may enhance the total dissolved radionuclide load	SO-C		**SCR.2.5.6** Section 6.4.3.5 Appendix SOTERM, Section 5 Appendix WCA, Section 4.1.3

EPA FEP I.D.	FEP Name	Issue	Screening Classification	Comments on Classification	CCA Cross References
W69	Organic ligands	Increased concentrations of organic ligands favor the formation of complexes	SO-C		**SCR.2.5.6** Section 6.4.3.5 Appendix SOTERM, Section 5 Appendix WCA, Sections 4.1.3, 8.11 and 8.12 Appendix BIR
W71	Kinetics of organic complexation	The rates of complex dissociation may affect radionuclide uptake and other reactions	SO-C		**SCR.2.5.6**
W72	Exothermic reactions	Exothermic reactions, including concrete and backfill hydration, and aluminium corrosion, may raise the temperature of the disposal system	SO-C		**SCR.2.5.7** *Section 6.4.3.5* Appendix WCA, Section 5.3.1
W73	Concrete hydration	Hydration of concrete in seals will enhance rates of salt creep and may induce thermal cracking	SO-C		**SCR.2.5.7** Appendix SEAL, Section 7.4.1.1
W75	Chemical degradation of backfill	Reaction of the MgO backfill with CO_2 and brine may affect disposal room permeabilities	SO-C		**SCR.2.5.8** Appendix BACK, Section 3.2
W83	Rinse	Rapid brine flow could wash active particulates from waste surfaces	SO-C		**SCR.2.6.3**
W88	Biofilms	Biofilms may retard microbes and affect transport of radionuclides	SO-C	Beneficial SO-C	**SCR.2.6.**
W89	Transport of radioactive gases	Gas phase flow could transport radioactive gases	SO-C		**SCR.2.6.5** **SCR.2.5.1.3**
W93	Soret effect	There will be a solute flux proportional to any temperature gradient	SO-C		**SCR.2.7.3**
W94	Electrochemical effects	Potential gradients may exist as a result of electrochemical reactions and groundwater flow and affect radionuclide transport	SO-C		**SCR.2.7.4**

EPA FEP I.D.	FEP Name	Issue	Screening Classification	Comments on Classification	CCA Cross References
W95	Galvanic coupling	Potential gradients may be established between metal components of the waste and containers and affect radionuclide transport	SO-P		**SCR.2.7.4** Appendix GCR
W96	Electrophoresis	Charged particles and colloids can be transported along electrical potential gradients	SO-C		**SCR.2.7.4**
W97	Chemical gradients	Chemical gradients will exist at interfaces between different parts of the disposal system and may cause enhanced diffusion	SO-C	p. SCR-87 incorrectly states that gradients are UP.	**SCR.2.7.5**
W98	Osmotic processes	Osmosis may allow diffusion of solutes across a salinity interface	SO-C	Beneficial SO-C	**SCR.2.7.5**
W99	Alpha recoil	Recoil of the daughter nuclide upon emission of an alpha-particle during radioactive decay at the surface of a solid may eject the daughter into groundwater	SO-C		**SCR.2.7.5**
W100	Enhanced diffusion	Chemical gradients may locally enhance rates of diffusion	SO-C		**SCR.2.7.5**
H1	Oil and gas exploration	Oil and gas exploration is a reason for drilling in the Delaware Basin	SO-C (HCN) DP (Future)	DP for boreholes that penetrate the waste and boreholes that penetrate Castile brine underlying the waste disposal region. SO-C for other future drilling.	**SCR.3.2.1** Section 2.3.1.2 *Section 6.4.7* Section 6.4.12.2 Appendix GCR, Section 8.4.8 Appendix DEL, Sections 4.2 and 7.4 Appendix PAR, Table PAR-53

EPA FEP I.D.	FEP Name	Issue	Screening Classification	Comments on Classification	CCA Cross References
H2	Potash exploration	Potash exploration is a reason for drilling in the Delaware Basin	SO-C (HCN) DP (Future)	DP for boreholes that penetrate the waste and boreholes that penetrate Castile brine underlying the waste disposal region. SO-C for other future drilling.	**SCR.3.2.1** Section 2.3.1.1 *Section 6.4.7* Section 6.4.12.2 Appendix GCR, Section 8.4.7 Appendix DEL, Sections 4.2 and 7.4 Appendix PAR, Table PAR-53
H4	Oil and gas exploitation	Oil and gas exploitation is a reason for drilling in the Delaware Basin	SO-C (HCN) DP (Future)	DP for boreholes that penetrate the waste and boreholes that penetrate Castile brine underlying the waste disposal region. SO-C for other future drilling.	**SCR.3.2.1** Section 2.3.1.2 Section 2.3.2.2 *Section 6.4.7* Section 6.4.12.2 Appendix DEL, Sections 4.2 and 7.4 Appendix PAR, Table PAR-53
H8	Other resources	Exploration for other resources could be a reason for drilling	SO-C (HCN) DP (Future)	DP for boreholes that penetrate the waste and boreholes that penetrate Castile brine underlying the waste disposal region. SO-C for other future drilling.	**SCR.3.2.1** Section 2.3.1.3 *Section 6.4.7* Section 6.4.12.2 Appendix GCR, Section 8.4 Appendix DEL, Sections 4.2 and 7.4 Appendix PAR, Table PAR-53

EPA FEP I.D.	FEP Name	Issue	Screening Classification	Comments on Classification	CCA Cross References
H9	Enhanced oil and gas recovery	Enhanced oil and gas recovery is a reason for drilling in the Delaware Basin	SO-C (HCN) DP (Future)	DP for boreholes that penetrate the waste and boreholes that penetrate Castile brine underlying the waste disposal region. SO-C for other future drilling.	**SCR.3.2.1** Section 2.3.1.2 *Section 6.4.7* Section 6.4.12.2 Appendix DEL, Sections 5.4 and 7.4 Appendix PAR, Table PAR-53
H10	Liquid waste disposal	Liquid waste disposal could be a reason for drilling	SO-R (HCN) SO-R (Future)		**SCR.3.2.1** Appendix DEL Section 5.4
H11	Hydrocarbon storage	Hydrocarbon storage could be a reason for drilling	SO-R (HCN) SO-R (Future)		**SCR.3.2.1**
H3	Water resources exploration	Water resources exploration is a reason for drilling in the Delaware Basin	SO-C (HCN) SO-C (Future)		**SCR.3.2.1** Section 2.3.1.3 Appendix DEL, Sections 4.2 and 7.4 Appendix USDW, Section 3
H5	Groundwater exploitation	Groundwater exploitation is a reason for drilling in the Delaware Basin	SO-C (HCN) SO-C (Future)		**SCR.3.2.1** Section 2.3.1.3 Appendix DEL, Sections 4.2 and 7.4 Appendix USDW, Section 3
H6	Archeological investigations	Archeological investigations could be a reason for drilling	SO-R (HCN) SO-R (Future)		**SCR.3.2.1** Section 2.3.2.3
H7	Geothermal	Geothermal energy could be a reason for drilling	SO-R (HCN) SO-R (Future)		**SCR.3.2.1**
H12	Deliberate drilling intrusion	Deliberate investigation of the repository could be a reason for drilling	SO-R (HCN) SO-R (Future)		**SCR.3.2.1**

EPA FEP I.D.	FEP Name	Issue	Screening Classification	Comments on Classification	CCA Cross References
H13	Potash mining	Potash mining is a reason for excavations in the region around WIPP	UP (HCN) DP (Future)	UP for mining outside the controlled area. DP for mining inside the controlled area.	**SCR.3.2.2** Section 2.3.1.1 Section 6.4.6.2.3 Section 6.4.12.8 Section 6.4.13.8 Appendix DEL, Section 7.4 Appendix MASS, Attachment 15-4 Appendix PAR, Parameter 34
H14	Other resources	Mining of other resources could be a reason for excavations	SO-C (HCN) SO-R (Future)		**SCR.3.2.2**
H15	Tunneling	Tunneling could be a reason for excavations	SO-R (HCN) SO-R (Future)		**SCR.3.2.2**
H16	Construction of underground facilities (for example storage, disposal, accommodation)	Construction of underground facilities could be a reason for excavations	SO-R (HCN) SO-R (Future)		**SCR.3.2.2**
H17	Archeological excavations	Archeological investigations could be a reason for excavations	SO-C (HCN) SO-R (Future)		**SCR.3.2.2** Section 2.3.2.3
H18	Deliberate mining intrusion	Deliberate investigation of the repository could be a reason for excavations	SO-R (HCN) SO-R (Future)		**SCR.3.2.2**
H19	Explosions for resource recovery	Underground explosions could affect the geological characteristics of surrounding units	SO-C (HCN) SO-R (Future)		**SCR.3.2.3.1**
H20	Underground nuclear device testing	Underground nuclear device testing could affect the geological characteristics of surrounding units	SO-C (HCN) SO-R (Future)		**SCR.3.2.3.2**

EPA FEP I.D.	FEP Name	Issue	Screening Classification	Comments on Classification	CCA Cross References
H21	Drilling fluid flow	Drilling within the controlled area could result in releases of radionuclides into the drilling fluid.	SO-C (HCN) DP (Future)	DP for boreholes that penetrate the waste. SO-C for other future drilling.	**SCR.3.3.1.1** Section 6.3.2.2 Section 6.4.7.1 Appendix DEL Sections 5.1.3 and 6.1.2.1, and Attachment 1 Appendix CUTTINGS, Appendix A.2.2 Appendix MASS, Attachment 16-2
H22	Drilling fluid loss	Borehole circulation fluid could be lost to thief zones encountered during drilling	SO-C (HCN) DP (Future)	DP for boreholes that penetrate the waste. SO-C for other future drilling.	**SCR.3.3.1.1** Section 6.4.7.1.1 Appendix PAR, Parameters 1 and 3, Table PAR-43
H23	Blowouts	Fluid could flow from pressurized zones through the borehole to the land surface	SO-C (HCN) DP (Future)	DP for boerholes that penetrate the waste and boreholes that penetrate Castile brine underlying the waste disposal region. SO-C for other future drilling.	**SCR.3.3.1.1** Section 2.2.1.3 Section 6.4.12.6 Section 6.4.7.1.1 Appendix DEL, Section 7.5 Appendix CUTTINGS, Appendix A.2.4.1 Appendix MASS, Attachment 16-2
H24	Drilling-induced geochemical changes	Movement of brine from a pressurized zone, through a borehole, into potential thief zones such as the Salado interbeds or the Culebra, could result in geochemical changes	UP (HCN) DP (Future)	SO-C for units other than the Culebra.	**SCR.3.3.1.1** *Section 6.4.3.6* Section 6.4.6.2 Section 6.4.6.6 Appendix MASS, Section 15.2 and Attachment 15-1 Appendix PAR Parameters 47 and 52 to 57, Table PAR-39 *Appendix SOTERM*

EPA FEP I.D.	FEP Name	Issue	Screening Classification	Comments on Classification	CCA Cross References
H25	Oil and gas extraction	Extraction of oil and gas could alter fluid-flow patterns in the target horizons, or in overlying units as a result of a failed borehole casing. Removal of confined fluids from oil- or gas-bearing units can cause compaction, potentially resulting in subvertical fracturing and surface subsidence	SO-C (HCN) SO-R (Future)		**SCR.3.3.1.2**
H26	Groundwater extraction	Groundwater extraction from formations above the Salado could affect groundwater flow	SO-C (HCN) SO-R (Future)		**SCR.3.3.1.2** Section 2.2.1.4.2.1 Section 2.3.1.3 Section 6.4.6.6 Section 8.2
H27	Liquid waste disposal	Injection of fluids could alter fluid flow patterns in the target horizons or, if there is accidental leakage through a borehole casing, in any other intersected hydraulically conductive zone	SO-C (HCN) SO-R (Future)		**SCR.3.3.1.3** *Section 2.3.1.1* Section 6.4.7.2 Appendix DEL, Sections 5.5 and 6
H28	Enhanced oil and gas production	Injection of fluids could alter fluid flow patterns in the target horizons or, if there is accidental leakage through a borehole casing, in any other intersected hydraulically conductive zone	SO-C (HCN) SO-R (Future)		**SCR.3.3.1.3** *Section 2.3.1.1* Section 6.4.7.2 Appendix DEL, Sections 5.5 and 6
H29	Hydrocarbon storage	Injection of fluids could alter fluid flow patterns in the target horizons or, if there is accidental leakage through a borehole casing, in any other intersected hydraulically conductive zone	SO-C (HCN) SO-R (Future)		**SCR.3.3.1.3**

EPA FEP I.D.	FEP Name	Issue	Screening Classification	Comments on Classification	CCA Cross References
H30	Fluid-injection induced geochemical changes	Injection of fluids through a leaking borehole could affect geochemical conditions in thief zones, such as the Culebra or the Salado interbeds	UP (HCN) SO-R (Future)	SO-C for units other than the Culebra	**SCR.3.1.3** Section 6.4.6.2 Section 6.4.6.6 Appendix MASS, Section 15.2 and Attachment 15-1 Appendix PAR, Parameters 47 and 52 to 57, Table PAR-39
H31	Natural borehole fluid flow	Natural borehole flow through abandoned boreholes could alter fluid pressure distributions	SO-C (HCN) DP (Future)	DP for boreholes that penetrate Castile brine underlying the waste disposal region. SO-C for other future boreholes.	**SCR.3.3.1.4** Section 6.4.7.2 Section 6.4.8 *Section 6.4.12.2* Section 6.4.12.7 Appendix MASS, Section 16.3 and Attachments 16-1 and 16-3 Appendix DEL, Sections 5.5 and 6 Appendix BRAGFLO, Section 4.8
H32	Waste-induced borehole flow	Abandoned boreholes that intersect a waste panel could provide a connection for transport away from the repository horizon	SO-R (HCN) DP (Future)	DP for boreholes that penetrate the waste. SO-C for other future boreholes.	**SCR.3.3.1.4** Section 6.4.7 Section 6.4.2.1 Section 6.4.12.7 Appendix MASS, Section 16.3 and Attachments 16-1 and 16-3 Appendix DEL, Sections 5.5 and 6 Appendix BRAGFLO, Section 4.8
H33	Flow through undetected boreholes	Undetected boreholes that are inadequately sealed could provide pathways for radionuclide transport	SO-P (HCN) NA (Future)		**SCR.3.3.1.4**

EPA FEP I.D.	FEP Name	Issue	Screening Classification	Comments on Classification	CCA Cross References
H34	Borehole-induced solution and subsidence	Boreholes could provide pathways for surface-derived water or groundwater to percolate into formations containing soluble minerals. Large-scale dissolution through this mechanism could lead to subsidence and to changes in groundwater flow patterns	SO-C (HCN) SO-C (Future)		**SCR.3.3.1.4** Section 3.3.4 Section 6.4.7.2 Appendix DEL, Sections 5.5 and 6
H35	Borehole-induced mineralization	Fluid flow through a borehole between hydraulically conductive horizons could cause mineral precipitation to change permeabilities	SO-C (HCN) SO-C (Future)		**SCR.3.3.1.4**
H36	Borehole-induced geochemical changes	Movement of fluids through abandoned boreholes could change the geochemistry of units such as the Salado interbeds or Culebra	UP (HCN) DP (Future)	SO-C for units other than the Culebra	**SCR.3.3.1.4** *Section 6.4.3.6* Section 6.4.6.2 Section 6.4.6.6 Appendix MASS, Section 15.2 and Attachment 15-1 Appendix PAR, Parameters 47 and 52 to 57, Table PAR-39
H37	Changes in groundwater flow due to mining	Fracturing and subsidence associated with excavations may affect groundwater flow patterns through increased hydraulic conductivity within and between units	UP (HCN) DP (Future)	UP for mining outside the controlled area. DP for mining inside the controlled area.	**SCR.3.3.2** Section 2.3.1.1 Section 6.4.6.2.3 Section 6.4.12.8 Section 6.4.13.8 Appendix CCDFGF, Section 3.2 Appendix DEL, Section 4.2.4 Appendix PAR, Parameter 34
H38	Changes in geochemistry due to mining	Fluid flow and dissolution associated with mining may change brine densities and geochemistry	SO-C (HCN) SO-R (Future)		**SCR.3.3.2** Section 2.3.1.1
H39	Changes in groundwater flow due to explosions	Fracturing associated with explosions could affect groundwater flow patterns through increased hydraulic conductivity within and between units	SO-C (HCN) SO-R (Future)		**SCR.3.3.3**

EPA FEP I.D.	FEP Name	Issue	Screening Classification	Comments on Classification	CCA Cross References
H40	Land use changes	Land use changes could have an effect upon the surface hydrology	SO-R (HCN) SO-R (Future)		**SCR.3.4.1**
H41	Surface disruptions	Surface disruptions could have an effect upon the surface hydrology	SO-C (HCN) SO-R (Future)		**SCR.3.4.1**
H42	Damming of streams or rivers	Damming of streams or rivers could have an effect upon the surface hydrology	SO-C (HCN) SO-R (Future)		**SCR.3.5.1**
H43	Reservoirs	Reservoirs could have an effect upon the surface hydrology	SO-C (HCN) SO-R (Future)		**SCR.3.5.1**
H44	Irrigation	Irrigation could have an effect upon the surface hydrology	SO-C (HCN) SO-R (Future)		**SCR.3.5.1**
H45	Lake usage	Lake usage could have an effect upon the surface hydrology	SO-R (HCN) SO-R (Future)		**SCR.3.5.1**
H46	Altered soil or surface water chemistry by human activities	Surface activities associated with potash mining and oil fields could affect the movement of radionuclides in the surface environment	SO-C (HCN) SO-R (Future)		**SCR.3.5.1**
H47	Greenhouse gas effects	Changes in climate resulting from increase in greenhouse gases could change the temperature and the amount of rainfall	SO-R (HCN) SO-R (Future)		**SCR.3.6.1**
H48	Acid rain	Acid rain could change the behavior of radionuclides in the surface environment	SO-R (HCN) SO-R (Future)		**SCR.3.6.1**
H49	Damage to the ozone layer	Damage to the ozone layer could affect the flora and fauna and their response to radioactivity	SO-R (HCN) SO-R (Future)		**SCR.3.6.1**

EPA FEP I.D.	FEP Name	Issue	Screening Classification	Comments on Classification	CCA Cross References
H50	Coastal water use	Coastal water usage could affect the uptake of radionuclides by animals and humans	SO-R (HCN) SO-R (Future)		**SCR.3.7.1**
H51	Sea water use	Sea water usage could affect the uptake of radionuclides by animals and humans	SO-R (HCN) SO-R (Future)		**SCR.3.7.1**
H52	Estuarine water use	Estuarine water usage could affect the uptake of radionuclides by animals and humans	SO-R (HCN) SO-R (Future)		**SCR.3.7.1**
H53	Arable farming	Arable farming could have an effect upon the surface hydrology	SO-C (HCN) SO-R (Future)		**SCR.3.8.1**
H54	Ranching	Ranching could have an effect upon the surface hydrology	SO-C (HCN) SO-R (Future)		**SCR.3.8.1** Section 2.3.2.2
H55	Fish farming	Fish farming could affect the uptake of radionuclides by animals and humans	SO-R (HCN) SO-R (Future)		**SCR.3.8.1**
H56	Demographic change and urban development	Demographic change and urban development could have an effect upon the surface hydrology	SO-R (HCN) SO-R (Future)		**SCR.3.8.2** Section 2.3.2.1
H57	Loss of records	Loss of records could change the effectiveness of institutional controls	NA (HCN) DP (Future)		**SCR.3.8.2** Section 6.3 Section 6.4.7 Section 6.4.12.1 Section 6.4.12.2 Section 7.3 Appendix EPIC, Section 6 Appendix PAR, Table PAR-53

ATTACHMENT 2

FEPs Reassessment Records Package
Submital
Cover Sheet

Sandia National Laboratories
Waste Isolation Pilot Plant

Compliance Recertification
FEPs Reassessment Records Package Submittal

Date

FEP EPA Identification Number **FEP ID**

FEP Title **Title as Appears in AP-090**

FEP Principal Investigator (Author)	Name		
	Print	Signature	Date
Implementing Principal Investigator	Name		
	Print	Signature	Date
Technical Reviewer		As Listed On DRC	
	Signature	Print	
Management Reviewer		As Listed On DRC	
	Signature	Print	
Quality Assurance Reviewer		As Listed On DRC	
	Signature	Print	

FEP Reassessment Change Summary And Records Package Checklist

1) Does this analysis change the screening ***decision*** as presented in the CCA?
☐--Yes ☐--No

2) Does this analysis change information in the screening ***argument*** as presented in the CCA?
☐--Yes ☐--No

3) Check all that apply:
   a. Screening argument changed based on new data/information ☐
   b. Screening argument changed based on EPA position(s) in 1998 certification basis ☐
   c. Screening argument changed based on experimental activities ☐
   d. Screening argument changed based on approved baseline change ☐
   e. Screening argument changed based on information submitted to EPA subsequent to the CCA but before the Final Certification Ruling of May 1998 ☐

4) If item 2 above is "Yes," attach draft Appendix SCR text to this package.

5) If item 2 above is "No," attach adequate justification to support a "no change needed" decision.

6) If these changes affect the implementation of this FEP within the PA system model, obtain implementing principal investigator's signature on cover of this attachment.

7) List each item attached and page count below:

Item	Description	Page Count
1		
2		
3		
4		
5		
6		
7		
Total		0

ATTACHMENT 3

Revised SCR Text Format Guide

SCR Template

The following template shall be used to develop the text for the revised Appendix SCR. The PI should provide the FEP reassessment information in the order provided within this template. The FTL is responsible for compiling the information provided by the PIs for each FEP. This template is provided to help ensure a consistent FEPs reassessment document.

SCR Section Number
FEP Title
EPA FEP Number

Existing *italicized* text from SCR or revised *italicized* text describing the FEP screening decision

Summary

The summary is introductory text that summarizes the FEPs disposition. This text communicates whether changes have been made to the original FEPs basis and the reason for the change. For FEPs with revisions, the summary is not intended to provide the entire story for impacts on a FEP but is an introduction. For FEPs with no revisions, the summary provides a brief justification explaining why no change has been made to the FEPs basis and references the FEPs records package that contains additional assessment information (generated per AP requirements).

FEPs Text

This section contains either the original CCA Appendix SCR text or revised text. The PI determines through the FEPs reassessment process, whether the text should simply be revised or corrected, or if a complete re-write of the text is appropriate.

Reference List

All references not included in the original Appendix SCR shall be listed. If references are made to CCA sections, the FEPs revision must include the page number(s) of the CCA. If the FEPs revision references information contained in or to be contained in the CRA text, a note must be provided in the references list such that the references can be reconciled in the final CRA. As stated in the AP, references that are not accessible to the general public cannot be used unless the references are included in the CRA or submitted to the EPA's recertification docket.